ENCODER PRODUCTS COMPANY

Optical Encoders And Accessories

Incremental Encoders
Absolute Encoders
Linear Measurement Solutions
Encoder Accessories

Optical Encoder Guide

ACCU CODER
by Encoder Products Company

CTi Automation - Phone: 800.894.0412 - Fax: 208.368.0415 - Web: www.ctiautomation.net - Email: info@ctiautomation.net

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New Products

The Tru-Trac™ Family – Finally! A simple, cost effective solution for linear measurement. The Tru-Trac™ family of products solves typical installation problems by integrating an encoder with a spring-loaded torsion assembly for easy mounting in almost any orientation, even upside-down. The Model TR1 incorporates a measuring wheel, while the Model TR2 incorporates a rack and pinion gear. See page 14 to see how the Tru-Trac™ can be a money saving solution!

EPC's Model 865T- Harsh, corrosive, or just plain messy environments, can often lead to premature equipment failure and costly downtime. The new Model 865T Stainless Steel C-face encoder can help. Designed to mount on NEMA C-face motors and engineered to handle the toughest industrial applications. See page 12 for details.

Dear Valued Customer:

Exciting things are happening at Encoder Products Company.

A new internet 3D Model Builder application now makes it easier than ever to incorporate 3D encoder models into your mechanical assembly designs.

The success of the original Tru-Trac™, Model TR1, has generated a new addition to the Tru-Trac™ family. The Model TR2 incorporates a rack and pinion gear with an encoder and spring loaded torsion arm assembly which provides gear driven reliability and accuracy.

A new stainless steel encoder, the Model 865T, mounts directly on NEMA C-face motors and is ideal for harsh or corrosive environments.

Our ever expanding website now includes a cross-reference feature making it even easier to find replacement encoders.

For customers concerned about RoHS and WEEE compliance, many of our products are now available for these markets.

There is more excitement to come; new innovative designs to solve your most challenging applications and additional web based tools to make selecting the right encoder easier.

We truly appreciate all of our loyal customers and look forward to continuing to fulfill all of your encoder needs for years to come.

Sincerely,

William F. Watt
Founder and CEO
Encoder Products Company

ACCU-CODER
by Encoder Products Company

ENCODER PRODUCTS COMPANY

Company History

Encoder Products Company Inc. (EPC) is a leading designer and world-wide manufacturer of motion sensing devices. Founded in 1969 by William Watt, EPC began operations with a small line of custom encoders. Today, more than 35 years later, EPC's popular Accu-Coder™ brand is the most complete line of incremental and absolute shaft encoders in the industry. Our core philosophy is that each and every customer deserves quality products, superior customer service, and expert support.

Business Partnerships

Fostering long term business partnerships with satisfied customers is what we do best, and the heart of our mission. We take pride in providing superior customer service and supplying you an encoder that functions precisely, dependably, and flawlessly. Listening to our customers needs, and designing products that provide solutions for them, is a key to our success. It isn't every company that can say they have satisfied their customers for over 35 years!

Innovative Design Team

At EPC, we concentrate on encoders, making us famous for paving the path of the encoder industry and providing encoder standards for our industry since 1969. First to design the cube style encoder, now an industry standard. First to resolve mounting installation problems by providing an industry first flexible-mounting system. First to include Opto-ASIC technology, which virtually eliminates miscounts by eliminating electrical noise, and enhancing signal quality. First to provide an encoder that operates at 120° C. First to provide 6000 CPR in a 1.5" diameter encoder. First to provide a 3 year standard warranty, demonstrating that we stand proudly behind the reliability of each of our products.

Solving Problems

For over 35 years, we have been solving encoder problems. Custom designs, faster delivery, and reliable products are all areas in which we excel. We believe that an encoder supplier should solve problems, not cause them.

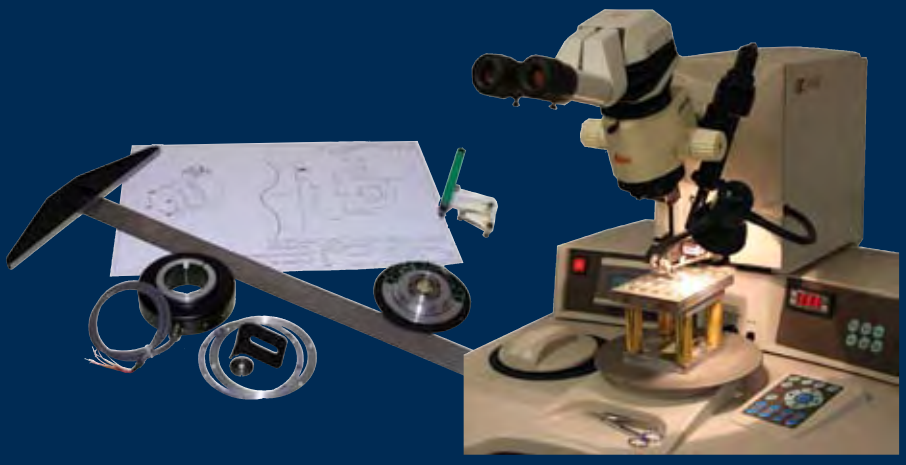
Custom Encoders Our Specialty

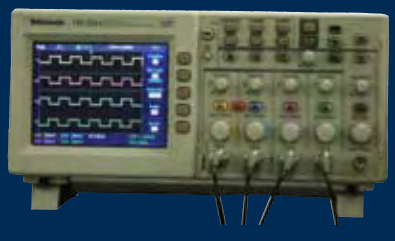
Through years of experience, we understand each industrial environment is different; you need an encoder that fits your specific situation. This ultimately means not having to make due with someone else's specifications or configurations, but having your own custom designed unit. Many of our customers have come to depend on us for this special area of customization. Using state of the art technology, we can design and deliver custom encoders faster than most suppliers standard products - often shipping your unique encoder in 2 to 6 days or sooner.

ISO 9001 Quality Systems

At EPC, quality is designed into every product. Before it's offered for sale, each Accu-Coder™ model is developed using state-of-the-art design tools and fully tested against EPC's exacting quality standards. But quality does not stop at design. During the manufacturing process, each Accu-Coder™ is subjected to a series of stringent quality control tests to ensure you are receiving the best encoder available. Our quality system has successfully been audited to the requirements of ISO 9001:2000, an internationally recognized standard for comprehensive Quality Systems. By paying close attention to detail, our Accu-Coder™ brand has become known throughout the industry for quality and reliability.

Accu-Coder™ Advantage





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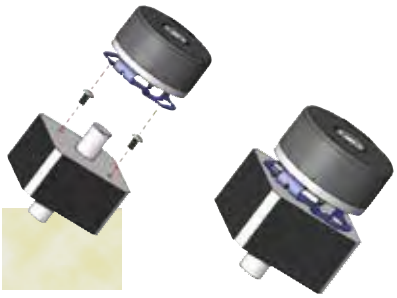
ACCU-CODER Advantage

Superior Design

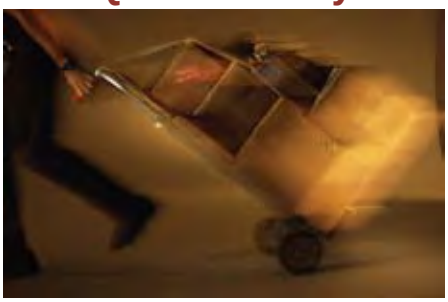


- First To Use Opto-ASIC Technology
- Creators Of The First Cube Encoder
- Creators Of The Original Tru-Trac™

Exceptional Value

We've Done Our Homework!
There Is No Better Encoder On
The Market For The Price!

Quick Delivery



- Standard delivery in 4 to 6 Days
- Next Day No Charge Express
- Expedite Delivery Available

Customer Service

A Helpful Customer Service
Representative Is Available From
5:00 am to 4:30 pm Pacific Time

Outstanding Quality

- ISO 9001:2000 Certified
- ISO Consortium (IIC) Members
- RoHS and WEEE Compliance

3 Year Warranty

The Best In The Industry!
3 Year Warranty

Shaft Encoder

Mounting Faces
Servo, Boss, Square Flange, Flexible Mounting Arms... EPC makes installation easy

Square Flange Mount

Bearings
EPC uses precision ABEC ball bearings

Thru-Bore Encoder

Connector Options
M12, 5- or 8-pin MS, 9-pin D-sub... EPC provides more connector options

Slotted Flex Mount

Accuracy
Opto-ASIC technology provides the cleanest signal available

Housings
Housings that can withstand rugged environments
Most Durable Housings:
- T6 Aluminum
- 316 Stainless Steel

Bores
Tolerances Rated to ANSI B4.I-1967, R1987 standards, Class LC5, H7. Huge selection of bore sizes available in both English and Metric sizes

Industrial Housings, Stainless Steel, or Absolutes: Get The Accu-Coder™ Advantage!

Shaft Seals
Prevent dust or water from entering internal components.

Shafts
Tolerances Rated to ANSI B4.I-1967, R1987 standards, Class LC5, g6. Made of Stainless Steel

For Detailed Information Concerning Warranty, Delivery, And Customer Service
See Pages 18-19

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Encoder Basics

Encoders provide motion control systems information on position, count, speed, and direction. As the encoder shaft rotates, output signals are produced, proportional to the distance (angle) of rotation. The signal may be in the form of a square wave (for an incremental encoder) or an absolute measure of position (for an absolute encoder).

Incremental Encoders

Incremental Encoders, and, in particular, incremental optical encoders, are the most popular choice of sensors in applications where mechanical motion must be processed into digital information. Compared with alternate technologies (such as resolvers, tachometers, etc.), optical encoders represent the best combination of accuracy, resolution, reliability, ruggedness, ease of use, value and variety of solutions in the industry. For these reasons, optical encoders are the overwhelming choice where velocity, acceleration, distance, position, or direction must be accurately and economically measured. Resolutions up to 30,000 counts per revolution (CPR) and operating temperatures up to 120° C (248° F) are just some of the features.

We have divided our incremental encoders into three model groups; Shaft Models, Bore Models, and Specialty Encoders which encompasses Motor Mount, Stainless Steel, Absolute, and Linear Encoders. Each model group has unique physical characteristics which include many mounting options, case styles, and useful features.

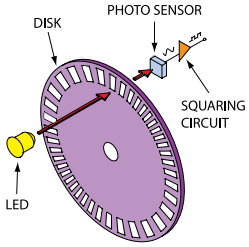
Absolute Encoders

As with all of EPC's encoders, these absolute encoders represent the best overall value available. Their simplified design make them ideal, cost-effective solutions to many problems faced in motion control and in industrial automation. They are particularly suited for applications where a device is inactive for long periods of time or moves at a slow rate, such as flood gate control, telescopes, cranes, valves, machine tooling, printing, paper making and many other industries.

Absolute encoders generate a unique binary "word" output for each resolvable shaft position so that each shaft position is fully determined. These code words can be created in Gray Code, Natural Binary Code, or Excess Gray Code. By using absolute position rather than incremental count data, the shaft position is always known, even after power interruptions. System design can also be simplified because there is no need to perform a reference cycle or return to home function to determine the true machine position.

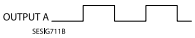
Optical Encoder Basics

Due to the performance and reliability advantages of the semi-conductor technology they incorporate, optical encoders are the preferred solution in many common computer, industrial, and automotive applications. Optical encoders also benefit from ease of customization, are suitable to numerous environments, and suffer no effects from high levels of stray magnetic fields.



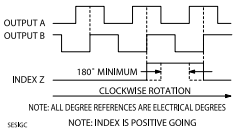
The basic construction of an incremental encoder is shown to the right. A beam of light emitted from an LED passes through a transparent disk patterned with opaque lines, and is picked up by a photodiode array. The photodiode array (also called a photosensor) responds by producing a sinusoidal waveform which is transformed into a square wave, or pulse train.

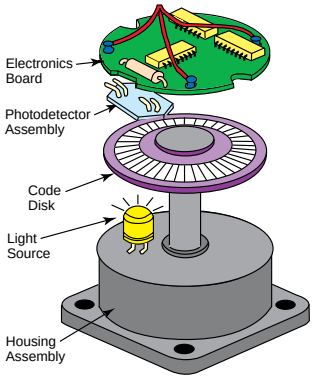
Single Channel Square Wave



Incremental encoders are available in two basic channel types, single channel and quadrature. A single channel encoder, often called a tachometer, is normally used in systems that rotate in one direction only, and require simple position and velocity information. Quadrature encoders have dual channels (A and B), phased 90 electrical degrees apart. These two output signals determine the direction of rotation by detecting the leading or lagging signal in their phase relationship. Quadrature encoders provide very high speed bi-directional information for complex motion control applications.

Quadrature Channel Square Wave



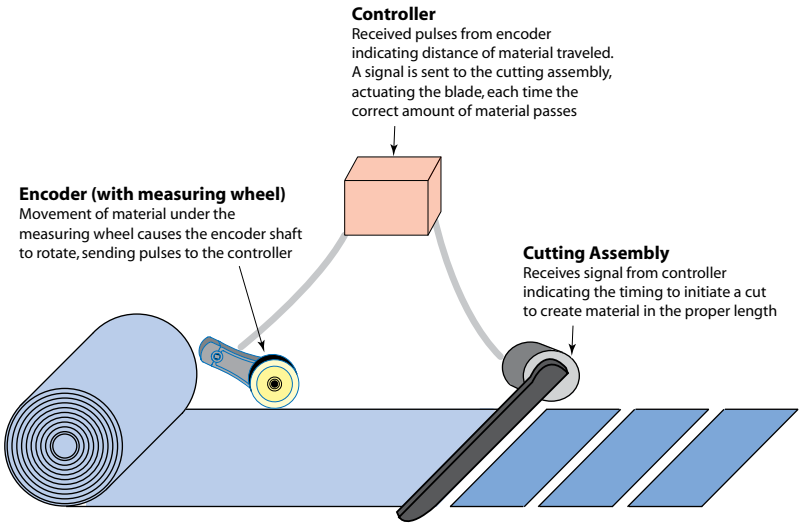


Incremental encoders can provide a once-per-revolution pulse (often called index, marker, or reference) that occurs at the same mechanical point of encoder shaft revolution. This pulse is on a separate output channel (Z) from the signal channel or quadrature outputs. The index pulse is often used to position motion control applications to a known mechanical reference.

Resolution is a term used to describe the Cycles Per Revolution (CPR) for incremental encoders, or the total number of unique positions per revolution for an absolute encoder. Each incremental encoder has a defined number of cycles that are generated for each full 360 degree shaft revolution. These cycles are monitored by a counter or motion controller and converted to counts for position and speed control.

Encoder Applications

Any application that measures speed, distance, or position can use an encoder. An example of how an encoder works in a motion control system is diagramed in this typical cut-to-length example below.


Controller
Received pulses from encoder indicating distance of material traveled. A signal is sent to the cutting assembly, actuating the blade, each time the correct amount of material passes
Encoder (with measuring wheel)
Movement of material under the measuring wheel causes the encoder shaft to rotate, sending pulses to the controller
Cutting Assembly
Receives signal from controller indicating the timing to initiate a cut to create material in the proper length

Accu-Coder™ Applications Include:

- Motor feedback
- Cut-to-Length
- Conveying/Gating
- Spooling
- CNC Machinery
- RFID/Labeling
- Robotics
- Security
- Printers/Plotters
- Sawmills
- Packaging
- Web Tensioning
- Elevators
- Filling
- Electronics
- Food Processing
- Machine Control
- Telescopes/Antennas
- Medical Diagnostics
- Typesetters
- Amusement/Gaming
- Chemical Processing

Automotive

Packaging

Printing and Binding

Cranes/Hoists/Elevators

Textiles

Metal and Petro-Chemical

Flood Gate Control/Irrigation

Semiconductor and Robotics

Lumber and Construction

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New Solutions

Direct Replacement Encoders

Direct Replacement Encoders (or DR's) are encoders frequently needed by replacement or retrofit repair services. These encoders are currently used on existing machinery in the industrial marketplace and will eventually need to be replaced. They are specifically designed to fill a void or solve a problem with a competitors encoder, such as a long delivery lead time, the manufacturer went out of business or no longer wants to manufacture these encoders, or their prices have significantly increased. Many of these encoders are pre-configured to the exact specifications of the original encoder, others have some configuration options, but all of these DR's are ready for fast shipment.

For The Hard To Find Encoder-Direct Replacements are Ready for Quick Delivery

Expert Cross Reference Service

Our Expert Cross Reference Service allows you to search for a competitors encoder that you need replaced, and identify the corresponding Accu-Coder™ model quickly.

Anti-Rotational Mounts

The NEW 225 Flex

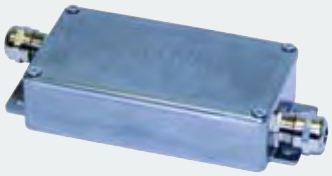
Anti-Rotational Flex Mounts provide added stability for your encoder against environmental conditions like vibration, rotation, and shock. EPC continues to increase its offerings of unique anti-rotational flex mounts supporting different bolt hole patterns for easy installation of your encoder.

Power Supplies

DIN Rail Power Supplies in Assorted Output Voltages

Small, easily mounted Din Rail power supplies specifically chosen to power encoders. Designed for space efficiency, these compact power supplies are available in 5, 12, or 24 VDC. Easy to see LED indicators show the power supply is working properly. Screw type terminals easily accommodate wires from AWG 24 to 14. The shock proof housing is both UL and CE approved. These supplies have been tested to work with all Accu-Coder™ encoders.

RX/TX Converter/Splitter/Repeater



The NEW RXTX Converter

The *RX/TX Repeater* retransmits signals from an encoder output, in order to drive signals over a longer distance with reduced noise and distortion free waveforms. The *RX/TX Splitter* has one input and two separate output channels, splitting the encoder signal. The *RX/TX Converter* converts a Push-Pull or NPN encoder output to an RS422 compatible differential Line Driver output. In addition, it will also convert Line Driver/RS422 encoder output, to single ended signals (Push-Pull) for compatibility with certain PLC's. The advantages to using an RXTX Converter/Splitter/Repeater would be:

- Greater immunity from electrical noise, signal distortion, and interference, especially with long cable runs.
- To enable devices with different output/input circuits to be connected.
- To properly terminate differential signals to eliminate/reduce signal distortions.
- Repeat differential signals for data transmission over long distances.
- Increase output current drive capability in order to drive multiple receivers.

Incremental Shaft Encoders

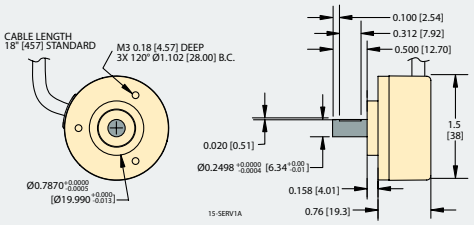
Model 15S

The Model 15S offers a high performance feedback solution in a low profile package, making the Model 15S ideal for commercial and light-duty industrial applications. This industry standard Size 1.5" diameter encoder features a precision bearing set, sealing available to IP64, a durable 1/4" or 6 mm stainless steel shaft, a selection of servo, flange, and face mount options, extended operating temperatures from -40° C to +120° C, and up to 12 pole commutation for brushless motor control. With Opto-ASIC Technology, the Model 15S is the perfect solution for demanding, precision OEM applications.

Features
- Very High Performance Economical Encoder
- Low Profile- Less Than 1.0” Height and 1.5” Diameter
- Extended Temperature Operating Ranges Available
- Up To 12 Pole Commutation Optional

Common Applications
Servo Motor Control, Robotics, Medical Diagnostic Equipment, Specialty Assembly Machines, Digital Plotters, Printers, Typesetting

Input Voltage.....5 VDC, 12 VDC, 5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 2540 CPR
Shaft Sizes .....0.250”, 6 mm
Mounting..... A variety of flange and servo mounts
Sealing..... Up to IP64 available
Operating Temp.....-20° to +85° C standard, -40° to +85° C low temp option,
-20 to +100° C high temp option, -20 to +120° C extreme temp option
Weight .....3 oz typical



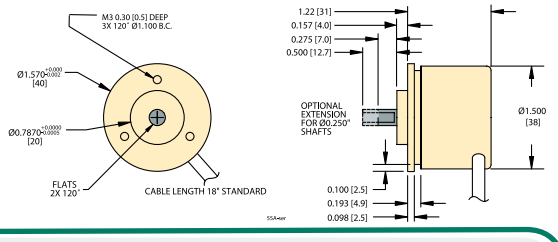
Model 755A

The Model 755A is ideal for applications requiring a small (1.5” x 1.5”), high precision, high performance encoder. Designed with all metal construction, shielded ball bearings, and a large range of resolutions, it will provide years of trouble free use for many different applications. Available with 4 servo mount options and a variety of shaft sizes and lengths. The optional flange mounting is ideal for applications requiring a bolt-on, high precision encoder. With its high reliability and quick delivery, the Model 755A is the perfect replacement for less reliable encoders of this size.

Features
- Miniature Size (1.5” Diameter)
- Flange and Servo Mounting
- Up To 30,000 CPR
- 1 MHz Frequency Response Available
- Extended Operating Temperature Range Available

Common Applications
Robotics, Assembly Machines, Motor-Mounted Feedback, Printers & Plotters, Elevator Controls, Medical Diagnostic Equipment

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 30,000 CPR
Shaft Sizes .....0.250”, 5 mm, 6 mm
Mounting.....A variety of flange and servo mounts
Operating Temp.....0° to +70° C standard, -40° to +70° C low temp option
0° to +100° C high temp option
Weight .....3 oz typical



Classic Cube Encoders

EPC set the industry standard for the original Cube encoders, and continues to enhance their Cubes Models while the competition copies them. The Model 711 Single Channel and 716 Quadrature Cube encoders are specifically designed for compatibility with most programmable controllers, electronic counters, motion controllers and motor drives. The Model 715 provides constant pulse width outputs for bi-directional feedback. The E-Cube™ version increases critical performance specifications for most popular resolutions, and features advanced Opto-ASIC circuitry. With 5 rugged housing styles, double shaft or 5PY options, and an abundance of connector options, there is an Accu-Coder™ Cube for every application.

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up on all models, Push-Pull, Line Driver also on Models 711, 716
Resolution.....Up to 2500 CPR Model 715 can multiply resolutions up to 4x
Shaft Loading .....Up to 30 lbs max Axial and 40 lbs max Radial (standard housing)
Shaft Sizes .....0.250”, 0.3125”, 0.375”, 0.500”, 0.625”
Mounting.....Tapped mounting holes on 3 sides for base or face mounting
Sealing.....Up to IP65 available (dependent on housing style)
Operating Temp.....Standard cube: 0° to +70° C E-Cube™: 0° to +85°, or 0° to +100° C for 5 to 24 VDC
Weight .....10 oz typical for standard housing

Additional Cube Housing Options

Industrial Cube

HD12 Housing

HD10 Housing

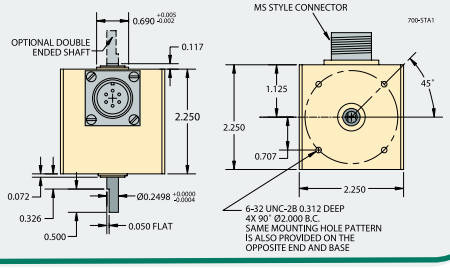
Explosion Proof Housing

Model 711 Single Channel Cube
Model 716 Quadrature Cube
Model 715 Timed Pulse Cube

Features- For All Cube Encoders
- The Original Industry-Standard Cube
- Five Versatile Housing Styles
- **Thousands of Configurations**
- Many New Resolutions Available

Common Applications
Feedback for Counters, PLC’s & Motors, Measuring for Packaging, Filling & Material Handling Machines, Wire Winding, Film Extrusion, Cut-To-Length

Standard Housing Drawing (Main Photo)



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Incremental Shaft Encoders

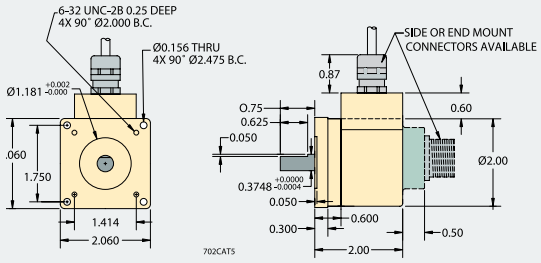
Model 702

The Model 702 is an extremely rugged, reliable, yet compact industry standard 2” diameter encoder designed for harsh factory and plant floor environments. The double shielded ball bearings are rated at 80 lb max Axial and Radial shaft loading to ensure a long operating life. Made to withstand the harsh effects of the real world, the Model 702 can be rated IP66 (NEMA 4 & 13) with the optional heavy duty shaft seal. With a variety of mounting options in both the flange and servo styles, the Model 702 is ideal for both new applications and replacements. If you need an encoder that won't let you down, the Model 702 is it.

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 30,000 CPR
Shaft Loading .....80 lbs max Axial and Radial
Shaft Sizes .....0.250”, 0.375”, 10 mm
Mounting.....A variety of flange and servo mounts
Sealing.....Up to IP66 (NEMA 13 & 4) available
Operating Temp.....0° to +70° C standard, 0° to +100° C high temperature option
Weight .....11 oz typical

Features
- Standard Size 20 package (2” x 2”)
- Flange and Servo Mounting
- Up To 30,000 CPR
- 80 lb Max Axial and Radial Shaft Loading
- IP66 Sealing Available

Common Applications
Conveyors, Elevator Control, Food Processing, Process Control, Robotics, Material Handling, Textile Machines



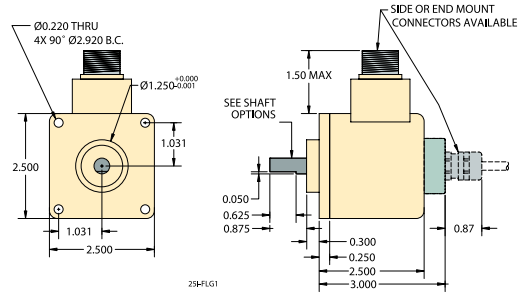
Model 725

The Model 725 is specifically designed for the challenges of an industrial environment. But don't let its tough exterior fool you; it still has the performance to reach resolutions up to 30,000 CPR. The Model 725 is available with both flange and servo mounting options, along with two distinctive 2.5" diameter housing styles. The rugged Standard Housing (N) isolates the internal electronics from the shock and stress of the outer environment. The extra heavy-duty Industrial Housing (I) features a fully isolated internal encoder that prolongs bearing life by using an internal flexible mount to protect the encoder from severe axial and radial shaft loading.

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 30,000 CPR
Shaft Loading .....Up to 45 lbs max Axial and 40 lbs max Radial
Shaft Sizes .....0.250”, 0.3125”, 0.375”, 6 mm, 8 mm, 10 mm
Mounting.....Flange, Servo, and 5PY mounts available
Sealing.....Up to IP66 (NEMA 13 & 4) available
Operating Temp.....0° to +70° C standard, 0° to +100° C high temperature option
Weight .....20 oz typical

Features
- Standard Size 25 package (2.5” x 2.5”)
- Standard and Industrial Housing Options
- Up To 30,000 CPR
- Servo and Flange Mounting
- IP66 Sealing Available

Common Applications
Conveyors, Elevator Control, Food Processing, Machine Control, Robotics, Material Handling, Textile Machines



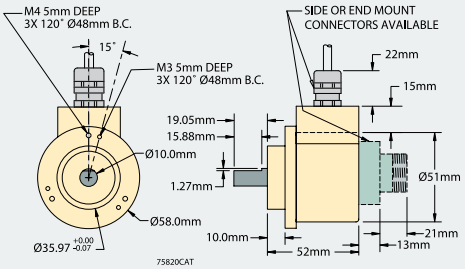
Model 758

The Model 758 is a heavy duty, extremely rugged, reliable, yet compact European standard 58 millimeter diameter encoder, designed for harsh factory and plant floor environments. Shaft loading is no problem for the double-shielded ball bearings; their 80 lb load rating ensures a long operating life. With the optional heavy-duty shaft seal, the Model 758 is rated IP66 (NEMA 13 & 4). Two European standard mounting options are available: Clamping Flange or Synchro Flange. The Model 758 is the perfect replacement encoder for units requiring the European mount.

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 30,000 CPR
Shaft Loading .....80 lbs max Axial and Radial
Shaft Sizes .....0.250”, 0.375”, 6 mm or 10 mm
Mounting.....Clamping Flange, or Synchro Flange
Sealing.....Up to IP66 (NEMA 13 & 4) available
Operating Temp.....0° to +70° C standard, 0° to +100° C high temperature option
Weight .....11 oz typical

Features
- European Standard Size 58 Mounting (58 mm Dia.)
- Up To 30,000 CPR
- 80 lb Max Axial and Radial Shaft Loading
- High Temperature Option (100° C)
- IP66 Sealing Available

Common Applications
Machine & Elevator Control, Food Processing, Robotics, Material Handling, Conveyors, Textile Machines



Incremental Thru-Bore Encoders

Model 15T/H

The Model 15T Thru-Bore, or 15H Hollow Bore, offers a high performance feedback solution in a low profile package. The Model 15 utilizes an integral bearing set, and an innovative flexible mounting system which is much more tolerant to axial misalignment or radial shaft run-out than “Kit” encoders. The easily installed slotted flex mounts provide 20 or 30 degrees of rotational adjustment for commutation or index pulse timing. For brushless servo motor applications, three 120° electrical phase tracks can provide up to 12 pole commutation feedback, while an optional 100° C and 120° C temperature options allow servo motors to operate at higher power outputs and duty cycles.

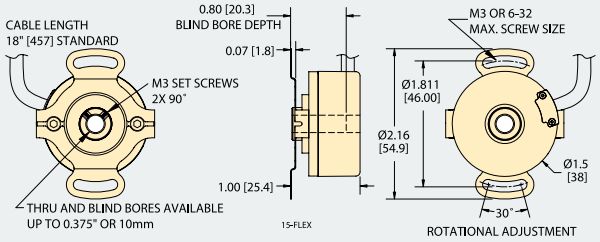
Input Voltage..... 5 VDC, 12 VDC, 5 to 28 VDC
Output Types ..... Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution..... Up to 2540 CPR
Bore Sizes ..... Range from 0.1875” to 0.375”, or 5 mm to 10 mm
Mounting..... A variety of Flexible Mounting Brackets
Sealing..... Up to IP64 available
Operating Temp ..... -20° to +85° C standard, -40° to +85° C low temp option,
-20 to +100° C high temp option, -20 to +120° C extreme temp option
Weight ..... 3 oz typical

Features

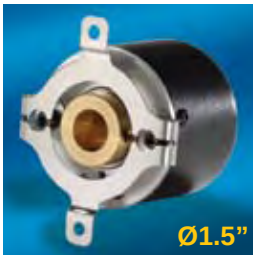
- Very High Performance Economical Encoder
- Low Profile 1.0” (25.4 mm) Height and 1.5” (38 mm) Diameter
- A Variety Of Bore Sizes For Thru-Bore or Hollow Bore Encoders
- Simple, Innovative Flex Mounting System
- Up To 12 Pole Commutation (for brushless motor control)
- Extended Operating Temperature Ranges

Common Applications

Servo Motor Control, Robotics, Medical Diagnostic Equipment, Specialty Assembly Machines, Digital Plotters, Printers, Typesetting



Model 755A



The Model 755A Hollow Bore is ideal for applications requiring a small, high precision encoder. Approximately 1.5" in diameter and 1.5" long, it will fit where many encoders cannot. All metal construction and shielded ball bearings provide years of trouble-free use. A variety of blind hollow bore sizes are available. Large bores allow for shafts up to 0.750" or 14 mm. Attaching directly to a motor is quick and simple with the innovative flex mount, first developed by EPC. This industry standard mount eliminates couplings, increases reliability, while reducing overall length and cost. A perfect replacement encoder where high reliability is required.

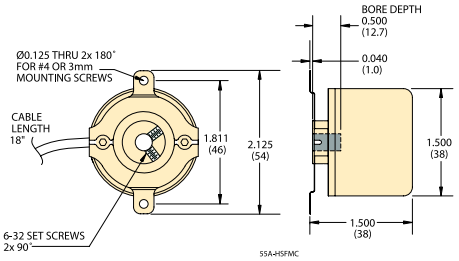
Input Voltage..... 5 to 28 VDC
Output Types ..... Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution..... Up to 30,000 CPR
User Shaft Runout ..... 0.007”
User Shaft Endplay..... ±0.030”
Bore Sizes ..... Range from 0.1875” to 0.750”, or 4 mm to 14 mm
Operating Temp ..... 0° to +70° C standard, -40° to +70° C low temp option
0° to +100° C high temp option
Weight ..... 3.5 oz typical

Features

- Miniature Size (1.5" Diameter)
- Up to 30,000 Cycles Per Revolution
- Flex Mounting
- Large Hollow Bore Option (up to 0.750”)
- Extended Operating Temperature Range Available

Common Applications

Robotics, Assembly Machines, Motor-Mounted Feedback, Phototypesetters, Printers & Digital Plotters, Elevator Controls, Medical Diagnostic Equipment



Model 121

AT LAST! A reliable modular encoder that requires no calibration, gapping, or special tools to install! EPC has taken the performance of modular encoders to a new level with the Model 121 Auto-Aligning Modular Encoder. This new and innovative design provides a hassle free installation. Simply tighten the shaft clamp, install the mounting screws, and you’re done! Warping and deflection, common problems with other modular encoder designs, are virtually eliminated by the Model 121’s all metal construction. The optional 100° C temperature capability allows servo motors to operate at higher power outputs and duty cycles.

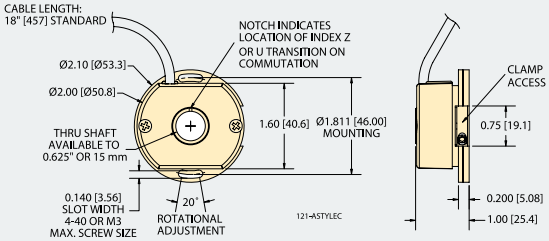
Input Voltage..... 5 VDC or 12 VDC
Output Types ..... Open Collector, Line Driver, Push-Pull
Resolution..... Up to 2,540 CPR
Commutation ..... 4, 6, 8, and 12 pole
Bore Sizes ..... Range from 0.250” to 0.625”, or 5 mm to 15 mm
Mounting..... Auto-Aligning Modular in an All Metal Housing
Operating Temp ..... 0° to +70° C standard, 0° to +100° C high temperature option
Weight ..... 4 oz typical

Features

- Simple, Hassle Free Mounting
- Accepts Larger Shafts up to 5/8” (or 15 mm)
- Up to 12 Pole Commutation Available
- 0° to 100° C Operating Temperature Available
- Includes New IP50 Dust Seal Kit

Common Applications

Servo Motor Control, Robotics, Specialty Assembly Machines, Digital Plotters, High Power Motors



CTi Automation - Phone: 800.894.0412 - Fax: 208.368.0415 - Web: www.ctiautomation.net - Email: info@ctiautomation.net

Incremental Thru-Bore Encoders

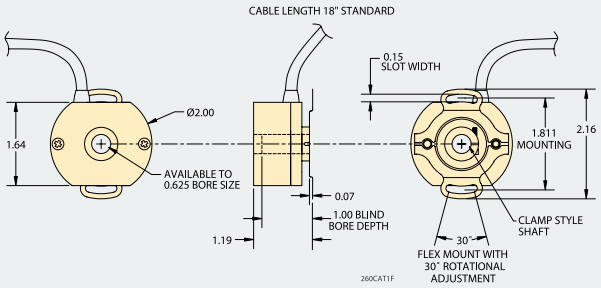
Model 260

The Model 260's large bore and low profile make it the perfect solution for many machine and motor applications; available in two distinct formats - a Hollow Bore and a complete Thru-Bore. Unlike traditional kit or modular encoder designs, it's integral bearing set provides stable and consistent operation without concerns for axial or radial shaft runout. For brushless servo motor applications, the Model 260 can be specified with up to 12 pole commutation feedback. The optional extended temperature capability allows servo motors to operate at higher power outputs and duty cycles. Now available with body mount or in-line M12 connector.

Input Voltage.....5 to 28 VDC
Output Types.....Open Collector, Line Driver, Push-Pull
Resolution.....Up to 2,540 CPR
Commutation.....4, 6, 8, and 12 pole
Bore Sizes.....Range from 0.250” to 0.625”, or 5 mm to 15 mm
Mounting.....A variety shaft clamps and flexible mounting arms
Operating Temp.....0° to 70° C standard, -40° to 70° C low temp option,
0 to 100° C high temp option, 0 to 120° C extreme temp option
Weight.....3.5 oz typical

Features
- Low Profile (1.19") Thru-Bore or Hollow Bore (Blind)
- Up to 12 Pole Commutation
- Simple, Innovative Flexible Mounting System
- Cable, and In-Line or Body Mount M12 Connectors

Common Applications
Brushless Servo Motor Commutation, Robotics, Motor-Mounted Feedback, Assembly Machines, Digital Plotters, High Power Motors



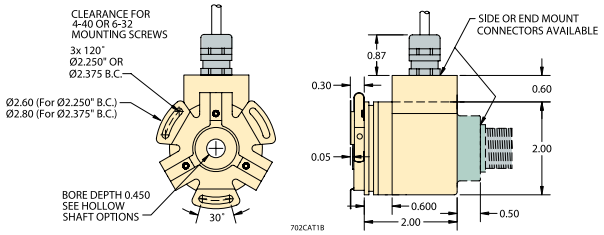
Model 702

The Model 702 Hollow Bore is an ultra-rugged, reliable, yet compact encoder designed for harsh factory and plant floor environments. Installation is quick and simple with a wide range of bore sizes and a flex mount design that easily slips over motor or machine shafts. Installation takes up less space, since no shaft couplings or mounting brackets are required. A variety of connector options are available for easy integration into your system. With its ultra-rugged construction, and numerous configuration options, the Model 702 is the ideal choice for a wide variety of industrial applications.

Input Voltage.....5 to 28 VDC
Output Types.....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 30,000 CPR
User Shaft Runout.....0.007”
User Shaft Endplay.....±0.030”
Bore Sizes.....Range from 0.250” to 0.625”, or 8 mm to 14 mm
Sealing.....Up to IP64 available
Operating Temp.....0° to +70° C standard, 0° to +100° C high temperature option
Weight.....11 oz typical

Features
- Standard Size 20 Package (2" x 2")
- Up to 30,000 CPR
- Easy Installation
- IP64 Sealing Optional

Common Applications
Motion Control Feedback, Conveyors, Elevator Controls, Machine Control, Food Processing, Process Control, Robotics, Material Handling, Textile Machines



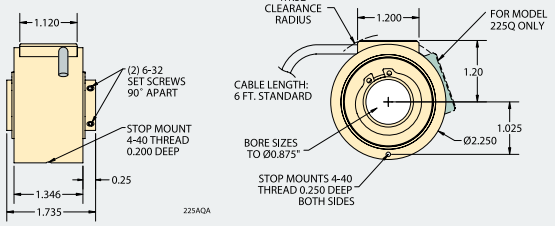
Model 225

Controlling motor speed is essential for many production assembly machines or robotic equipment. For tachometer feedback, or motor speed control applications, the Model 225 is the ideal encoder choice. The Model 225 is a Thru-Bore encoder, available in both single channel (225A) and quadrature (225Q) models, that provides a cost effective solution for simple measurement. Features include an all metal housing, a variety of connector options, and easy-to-install Thru-Bore design that make the Model 225 ideal for many motion control and manufacturing applications.

Input Voltage.....5 to 24 VDC
Output Types.....Open Collector, Pull-Up
Resolution.....Up to 600 CPR for Model 225A, 100 CPR for Model 225Q
Bore Tolerance.....Bore H7 fit for g6 shaft Class LC5 per ANSI B-4.I Standard
Bore Sizes.....Range from 0.250” to 0.875”, or 7 mm to 22 mm
Operating Temp.....0° to +70° C
Weight.....10 oz typical

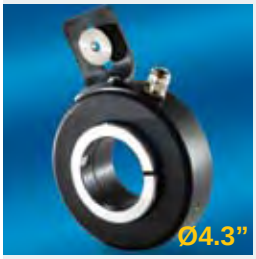
Features
- Single Channel & Quadrature Models
- Easy To Mount Economical Thru-Bore Design
- Metal Construction
- Bore Sizes To 0.875" or 22 mm

Common Applications
Brushless Servo Motor Commutation, Robotics, Motor-Mounted Feedback, Assembly Machines, Digital Plotters, High Power Motors



Incremental Thru-Bore Encoders

Model 775/776

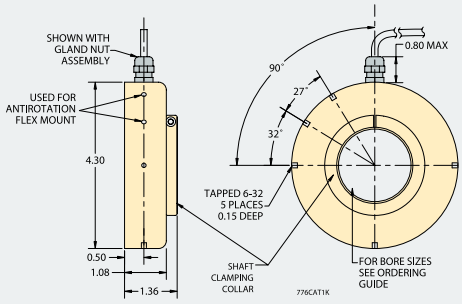


The sleek design of the Model 775 and 776 Thru-Bore encoders makes form and function a successful reality. The slim profile and Thru-Bore design, makes installation easy by simply slipping the bore over motor shafts up to 1.875” in diameter. The advanced Opto-ASIC electronics provide the superior noise immunity necessary in many industrial applications. With a variety of bore sizes, resolutions, and connector types, application possibilities are endless.

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 4096 CPR
User Shaft Runout.....0.005” Max
User Shaft Endplay.....±0.030” with appropriate flex mount
Bore Sizes .....Range from 0.625” to 1.875”, or 14 mm to 43 mm
Mounting.....Thru-Bore with collet clamp or single-screw clamp
Operating Temp .....0° to +70° C standard, 0° to +100° C high temperature option
Weight .....1 lb typical with standard cable option

Features
- Thru-Bore Design For Easy Mounting
- Bore Options to 1.875" or 43 mm
- Resolutions to 4096 CPR
- 100º C Operating Temperature Available
- CE Marking Available

Common Applications
Motor Feedback, Velocity & Position Control, Food Processing, Robotics, Material Handling



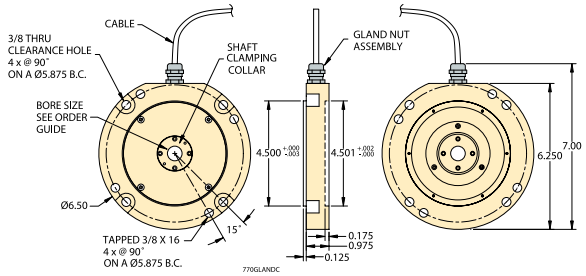
Model 770

The Model 770 is a rugged, high resolution encoder designed to mount directly on NEMA C Face motors. Both sides of the encoder are C Face mounts, allowing additional C Face devices to be easily mounted. Many competitive C Face encoders are kit type, but the Model 770 contains precision bearings and an internal flex mount that virtually eliminates encoder failures and inaccuracies induced by motor shaft runout or axial endplay. The Thru-Bore design allows fast and simple mounting of the encoder directly to the accessory shaft or to the drive shaft of the motor, using the standard motor face (NEMA sizes 56C thru 184C).

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 4096 CPR
User Shaft Runout.....0.005”
User Shaft Endplay.....±0.015”
Bore Sizes .....Range from 0.625” to 1.000”, or 14 mm to 24 mm
Mounting.....NEMA 56C to 184C
Operating Temp .....0° to +70° C standard, 0° to +100° C high temperature option
Weight .....2.6 lb typical with standard cable option

Features
- Slim Profile- Only 0.975” Deep
- Fits NEMA Size 56C Thru 184C Motor Faces (4.5" AK)
- Incorporates Opto-ASIC Technology
- Resolutions to 4096 CPR

Common Applications
Motor Feedback, Velocity & Position Control, Conveyors, Variable Speed Drives, Mixing and Blending Motors, Assembly and Specialty Machines.



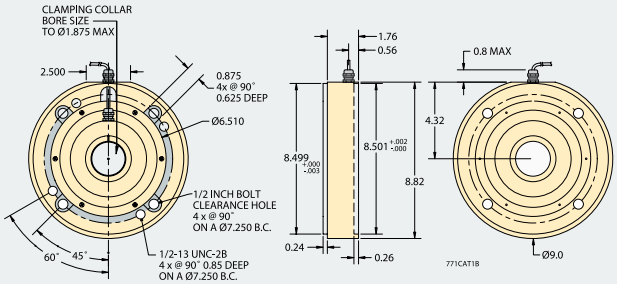
Model 771

The Model 771 is a rugged, high resolution encoder designed to mount directly on NEMA C Face motors. The Model 771 has all the benefits of the Model 770, such as a slim profile and Opto-ASIC technology, with the added advantage of larger bore sizes. Shafts as large as 43 mm will fit this Thru-Bore encoder, allowing fast and simple mounting directly to the accessory shaft or drive shaft of a motor using a NEMA standard motor face (sizes 182TC - 256TC). The tough all metal housing resists the vibration and hazards of an industrial environment.

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 4096 CPR
User Shaft Runout.....0.005”
User Shaft Endplay.....±0.01”
Bore Sizes .....Range from 1.125” to 1.875”, or 28 mm to 43 mm
Mounting.....NEMA 182TC to 256TC
Operating Temp .....0° to +70° C standard, 0° to +100° C high temperature option
Weight .....7 lb typical with standard cable option

Features
- Large Bore size to 1.875” or 43 mm
- Fits NEMA Size 182TC - 256TC Motor Faces (8.5" AK)
- Incorporates Opto-ASIC Technology
- Resolutions to 4096 CPR

Common Applications
Motor Feedback, Velocity & Position Control, Servo Control Systems, Assembly & Specialty Machines, Elevator Controls



Motor Mount Encoders

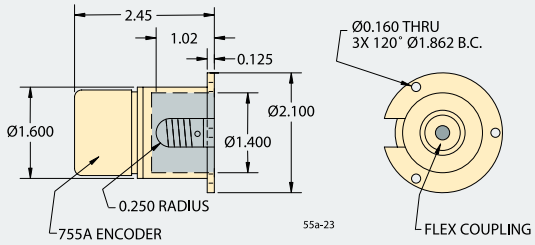
Model 755A

The Model 755A NEMA 23/34 encoder, with it's integral shaft coupling, is designed for easy installation on industrial size NEMA 23 or 34 motor frames. It features standard bolt circle patterns, and can accommodate shaft sizes of 0.250", 0.375", or 6 mm. With its rugged all metal housing, and a wide range of CPR options, it will fit in many different applications, providing years of trouble free use.

Features
- Standard NEMA Mounting
- Up to 30,000 Cycles Per Revolution
- High Temperature Option

Common Applications
Brushless Servo Motor Commutation, Robotics, Motor-Mounted Feedback, Assembly Machines, Digital Plotters, High Power Motors

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 30,000 CPR
Mounting.....NEMA 23 OR 34 with 0.250", 0.375" or 6 mm coupling
Max Shaft Speed.....7500 RPM
Frequency.....Up to 1 MHz
Operating Temp.....0° to +70° C standard, -40° to +70° C low temp option, 0° to +100° C high temp option
Weight .....4.5 oz typical NEMA 23, 6.75 oz typical NEMA 34



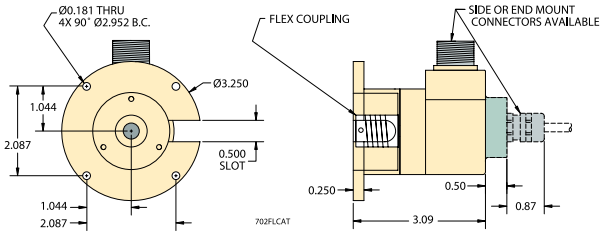
Model 702

The Model 702 Motor Mount encoder is a heavy duty, ultra- rugged, reliable, yet compact industry standard 2 inch diameter encoder. It is designed to withstand harsh factory and plant floor environments. The mounting flange with integral shaft and coupling allows the Model 702 encoder to be easily installed on a motor or shaft assembly, without the need for additional brackets or couplings. With the ability to handle shaft speeds of up to 8000 RPM, and withstand the shock and vibration of high speed servo motors, you are sure to be pleased with the Model 702 Motor Mount encoder.

Features
- Up to 30,000 CPR
- IP66 Sealing Available
- Mounting Flange Available With Boss

Common Applications
Servo & Stepper Motor Control, Robotics, X-Y Positioning Tables, Machine Tools

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 30,000 CPR
Mounting.....Integral Shaft Coupling With or Without Boss
Max Shaft Speed.....8000 RPM
Frequency.....Up to 1 MHz
Sealing.....Up to IP66 (NEMA 13 & 4) available
Operating Temp.....0° to +70° C standard, 0° to +100° C high temperature option
Weight .....14 oz typical



Stainless Steel Encoders

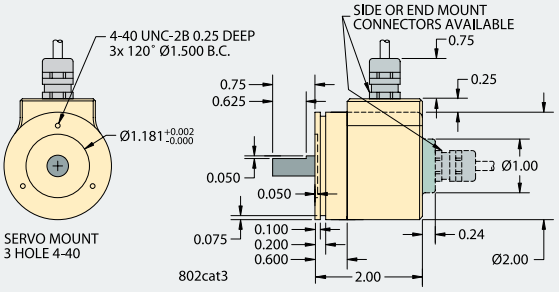
Model 802S

The Model 802S is a heavy duty, industry standard 2.0" diameter encoder specifically designed for harsh factory and plant floor environments. Its heavy duty, double shielded ball bearings are rated at 80 pounds maximum axial and radial shaft load, ensuring long operating life. This ultra-rugged, yet compact encoder is housed in a type 316 stainless steel enclosure, making it ideal for applications where contamination or exposure to caustic chemicals is a concern. But don't let its tough exterior fool you, the Model 802S provides the precise, reliable output you've come to expect from EPC.

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 30,000 CPR
Shaft Loading .....80 lbs max Axial and Radial
Shaft Sizes .....0.250”, 0.375” or 10 mm
Mounting.....A variety of flange and servo mounts
Sealing.....Up to IP66 (NEMA 13 & 4) available
Operating Temp.....0° to +70° C standard, 0° to +100° C high temperature option
Weight .....1.5 lb typical

Features
- Industry Standard Size 2.0” Stainless Steel Package
- Flange and Servo Mounting
- Up to 30,000 CPR
- 80 lb Maximum Axial and Radial Shaft Loading
- IP66 Sealing Available

Common Applications
Food Processing, Oil, Gas & Chemical Processing, Conveyors, Robotics, Elevator Controls, Textile Machines



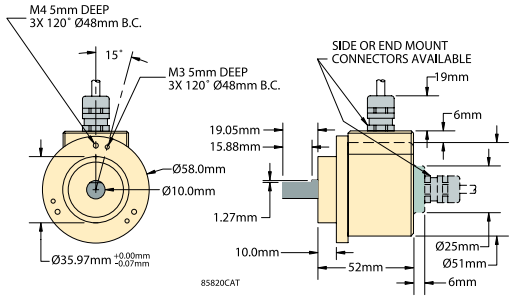
Model 858S

The Model 858S is a heavy duty, extremely rugged, reliable encoder, in a 316 stainless steel package. Its compact design is well suited for harsh factory and plant floor environments, calling for a metric solution. The double-shielded ball bearings are rated at 80 pound maximum axial and radial shaft loading, to ensure a long operating life. Shock rating is 75 g for 11 milliseconds duration. With the optional heavy-duty shaft seal installed, the Model 858S is rated at IP66 (NEMA 4 & 13). Two European standard mounting options are available, the Clamping Flange, or the Synchro Flange.

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 30,000 CPR
Shaft Loading .....80 lbs max Axial and Radial
Shaft Sizes .....0.250”, 0.375”, 6 mm, 10 mm
Mounting.....Clamping Flange, or Synchro Flange
Sealing.....Up to IP66 (NEMA 13 & 4) available
Operating Temp.....0° to +70° C standard, 0° to +100° C high temperature option
Weight .....1.5 lb typical

Features
- Industry Standard Size 58 mm Stainless Steel Package
- Up to 30,000 CPR
- 80 lb Maximum Axial and Radial Shaft Loading
- 100º C Operating Temperature Available
- IP66 Sealing Available

Common Applications
Food Processing, Oil, Gas & Chemical Processing, Conveyors, Robotics, Elevator Controls, Textile Machines



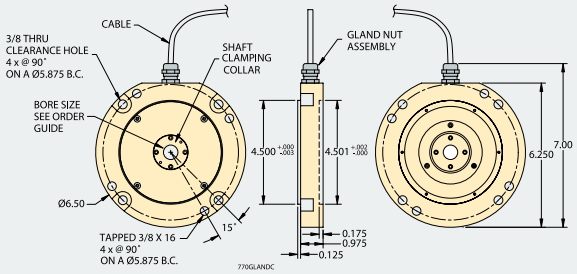
Model 865T

The Model 865T is a rugged, high resolution encoder designed to mount directly on NEMA C Face motors. Both sides of the encoder are C Face mounts, allowing additional C Face devices to be mounted to this encoder. Unlike many C Face kit type encoders, the Model 865T contains precision bearings and an internal flex mount, virtually eliminating encoder failures and inaccuracies induced by motor shaft runout or axial endplay. With Opto-ASIC technology, this encoder is ideal for applications using induction motors and flux vector control. The tough, 316 stainless steel housing resists the corrosion and hazards of a caustic industrial environment.

Input Voltage.....5 to 28 VDC
Output Types .....Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution.....Up to 4096 CPR
Bore Sizes .....Range from 0.625” to 1.00”, or 14 mm to 24 mm
Mounting.....Fits NEMA Size 56C Thru 184C Motor Faces (4.” AK)
Sealing.....Up to IP66 (NEMA 13 & 4) available
Operating Temp.....0° to +70° C standard, 0° to +100° C high temperature option
Weight .....6 lb typical

Features
- C Face Thru-Bore With Stainless Steel Housing
- Fits NEMA Size 56C Thru 184C Motor Faces (4.5" AK)
- Slim Profile - Only 1.0" Deep
- Resolutions to 4096 CPR

Common Applications
Motor Feedback, Velocity & Position Control, Conveyors, Variable Speed Drives, Mixing & Blending Motors, Assembly & Specialty Machines



Absolute Encoders

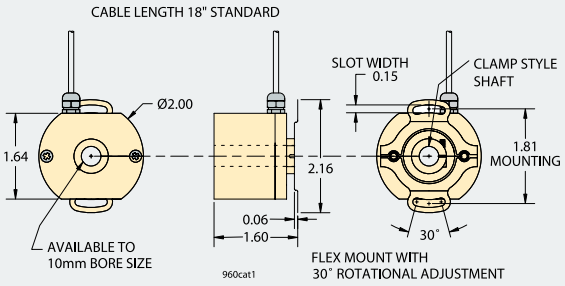
Model 960

The single-turn Model 960 Absolute Series Accu-Coder™ provides an unique solution to a wide variety of industrial applications requiring absolute position information. By providing a low profile package of just 1.55”, a variety of hollow and thru-bore sizes, and an easy to use flexible mounting system, the Model 960 goes where traditional absolute encoders do not fit. The Model 960 can easily be mounted directly on a motor shaft, bringing the advantage of absolute positioning while eliminating the fixtures, couplers, and adapters required by other absolute encoder designs.

Input Voltage.....4.75 to 26 VDC
Output Types .....Open Collector, Push-Pull
Resolution.....8, 9, 10, 11 bit
Shaft Runout .....0.007”
Shaft Endplay .....0.030”
Bore Sizes .....0.250”, 0.375”, 6 mm, 8 mm, 10 mm
Mounting.....Slotted Flex, or Flexible Mounting Arm
Operating Temp .....0° to 70° C standard
Weight .....7 oz typical

Features
- Low Profile - 1.55"
- Thru-Bore or Hollow Bore Styles
- Industrial Grade, Heavy Duty Housing
- State-of-the-Art Opto-ASIC Circuitry

Common Applications
Machine Tools, Robotics, Telescopes, Antennas, Rotary & X-Y Positioning Tables, Medical Scanners



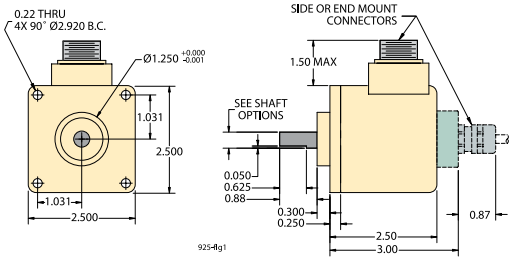
Model 925

The Model 925 Single Turn Absolute Accu-Coder™ is ideal for a wide variety of industrial applications that require an encoder with the capability of absolute positioning output. Its fully digital output and innovative use of Opto-ASIC technology make the Model 925 an excellent choice for all applications, especially ones with a high presence of noise. It offers both flange and servo mounting and is easily designed into a variety of application requirements. The Model 925, with its wide selection of shaft sizes supported by industrial grade, heavy duty bearings, and its optional IP66 seal, is an ideal encoder for tough, industrial environments.

Input Voltage.....4.75 to 26 VDC
Output Types .....Open Collector, Push-Pull
Resolution.....To 4096 In Gray, Natural Binary, or To 4000 In Excess Gray
Shaft Loading .....40 lbs max Axial and 35 lbs Radial
Shaft Sizes .....0.250”, 0.3125”, 0.375” 6 mm, 8 mm, 10 mm
Mounting.....Flange and servo mounts
Sealing.....Up to IP66 (NEMA 13 & 4) available
Operating Temp .....0° to 70° C standard
Weight .....22 oz typical

Features
- Standard Size 25 Package (2.5")
- Resolutions Up To 12 Bit (4096 Counts)
- Incorporates Opto-ASIC Technology
- Industrial Grade, Heavy Duty Housing
- Wide Range of Operating Voltages (4.75 to 26 VDC)

Common Applications
Machine Tools, Robotics, Telescopes, Antennas, Rotary & X-Y Positioning Tables, Medical Scanners



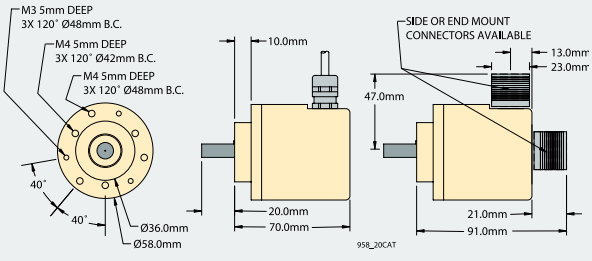
Model 958

The Model 958 Single Turn Absolute Accu-Coder™ is a European standard 58 mm mount, with absolute positioning output. A rugged, industrial grade housing allows the Model 958 to be used in a wide variety of applications calling for a reliable, heavy-duty encoder. Available with either Clamping Flange or Synchro Flange mounting, and a variety of connector and cabling options, the Model 958 is easily designed into a variety of applications. The Model 958 can also be ordered with stainless steel housing, heavy duty bearings, and an IP66 seal. With so many options that make the Model 958 ultra-durable, this absolute encoder can tolerate the worst environments!

Input Voltage.....4.75 to 26 VDC
Output Types .....Open Collector, Push-Pull
Resolution.....To 4096 In Gray, Natural Binary, or To 4000 In Excess Gray
Shaft Loading .....27 lbs max Axial and Radial
Shaft Sizes .....0.250”, 0.375”, 6 mm, 10 mm
Mounting.....Clamping Flange, or Synchro Flange
Sealing.....Up to IP66 (NEMA 13 & 4) available
Operating Temp .....0° to 70° C standard
Weight .....22 oz typical

Features
- European Size 58 (58 mm) Package
- Resolutions Up To 12 Bit (4096 PPR equivalent)
- Industrial Grade, Heavy Duty Housing
- Wide Range of Operating Voltages (4.75 to 26 VDC)

Common Applications
Machine Tools, Robotics, Telescopes, Antennas, Rotary & X-Y Positioning Tables, Medical Scanners



Stainless Steel & Absolute Encoders

Linear Measurement Solutions

Model LCE

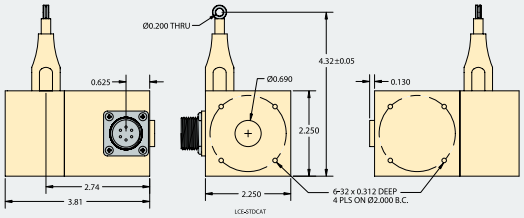
Linear Cable Encoder

The Linear Cable Encoder (LCE) is a low cost alternative for obtaining accurate linear measurements. The LCE has a retractable stainless steel cable, allowing for numerous and unusual measuring configurations. Placing the LCE away from harsh environmental conditions, while still providing precise measurements, gives the LCE an outstanding advantage over shaft style encoders. Installation is easy and perfect parallel alignment is no longer necessary. The LCE provides a reliable digital pulse train, with resolutions down to 0.002" per cycle. The small overall size, variety of resolutions, and many different connector types, makes the versatility of the LCE unbeatable!

Features
- Low Cost Linear Solution
- Resolutions from 2 to 500 Cycles Per Inch
- IP65 Sealing Available
- 0 Inch to 50 Inch Cable Measurement

Common Applications
Robotics, Extrusion Presses, Valve Positioning, Textile Machinery, Control Gate Positioning

Input Voltage..... 5 to 28 VDC
Output Types ..... Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution..... Up to 0.002" per cycle (500 CPI)
Cable Length ..... Up to 50 Inches
Housing ..... Standard and Industrial Housing Available
Mounting..... A variety of Cable Exits
Sealing..... Up to IP65 available
Operating Temp ..... 0° to +85° C, or 0° to +100° C at 5 to 24 VDC
Weight ..... 19 oz typical



Model TR1 Tru-Trac™

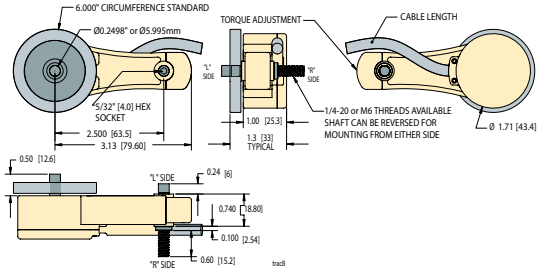
Measuring Wheel And Encoder

FINALLY! An integrated encoder and spring loaded measuring wheel assembly available in one, easy-to-use, compact unit. The NEW Tru-Trac™ is a versatile solution for tracking velocity, position, or distance over a wide variety of surfaces in almost any application. It's spring-loaded torsion arm provides a simple-to-adjust torsion load, allowing it to be mounted in almost any orientation, even upside-down. The housing is a durable, conductive composite material that will eliminate static build up. With operating speeds up to 3000 feet per minute and a wide variety of configuration options, it's easy to see the Tru-Trac™ is the ideal solution for countless applications.

Features
- Integrated Encoder And Measuring Wheel Solution
- Can Be Installed Vertical, Horizontal, or Upside-Down
- Operates At Speeds Up To 3000 Feet Per Minute
- Integrated Module Simplifies System Design

Common Applications
Web Tension Control, Paper Monitoring, Glue Dispensing, Linear Material Monitoring, Conveyor Systems, Printing, Labeling, Document Handling

Input Voltage..... 5 to 28 VDC
Output Types ..... Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution..... Up to 2540 CPR
Wheel Sizes..... 6", or 200 mm circumference Knurled or Urethane treads
Mounting..... Can be mounted from either left or right side, and is reversible
Sealing..... Up to IP65 available
Operating Temp ..... -20° to +85° C standard, -40° to +85° C low temp option,
-20° to +100° C high temp option
Weight ..... 5 oz typical



Model TR2 Tru-Trac™

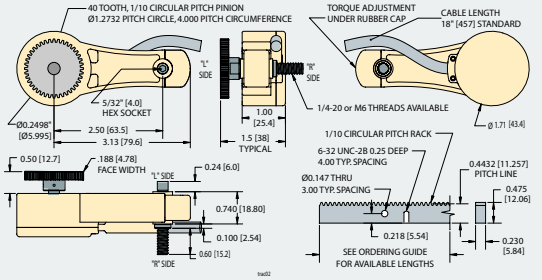
Rack and Pinion Gear Encoder

Backlash B-Gone! At last, a linear encoder solution with virtually no back-lash and virtually no slippage. Introducing the Model TR2, an integrated encoder and rack and pinion gear assembly. The NEW TR2 Tru-Trac™ is a versatile solution for tracking velocity, position, or distance in almost any application. With the Rack and Pinion gear system, encoder readings can be obtained with repeatable positioning. Racks can be ordered in varying lengths, and with preset gear fittings, installation is simple. With all the flexibility and maneuverability of the original TR1 Tru-Trac™, the new TR2 is on the right Track for success!

Features
- Integrated Encoder With Rack and Pinion Gear
- Can Be Installed Vertical, Horizontal, or Upside-Down
- Spring Loaded Torsion Arm Eliminates Backlashing
- Additional Rack Lengths Can Be Added To System.

Common Applications
X-Y Tables, Gantry Systems, Machine Shop Equipment, Cut-To-Length, Linear Material Monitoring, Printing, Labeling, Document Handling

Input Voltage..... 5 to 28 VDC
Output Types ..... Open Collector, Pull-Up, Line Driver, Push-Pull
Resolution..... Up to 2500 CPI (using 4X Quad Counting & 4" Circumference Gear)
Rack Size ..... 1/10 circular pitch. Available in 12", 24", and 36" lengths
Mounting..... Can be mounted from either left or right side, and is reversible
Sealing..... Up to IP65 available
Operating Temp ..... -20° to +85° C standard, -40° to +85° C low temp option,
-20° to +100° C high temp option
Weight ..... 5 oz typical without Rack



CTi Automation - Phone: 800.894.0412 - Fax: 208.368.0415 - Web: www.ctiautomation.net - Email: info@ctiautomation.net

Encoder Accessories

Mating Connectors and Pre-Wired Cable/Mating Connector Assemblies

EPC stocks an extensive selection of high quality connectors, cables, cable assemblies, and cordsets to optimize encoder performance; most can be ordered with MS style or M12 connectors.

M12 (12 mm) Cordsets

M12 (12 mm) cordsets are available for use with 5- or 8-pin M12 connectors. Cable lengths may vary.

Shaft Couplings

EPC's precision shaft couplings are carefully manufactured to optimize performance, reduce the chance of premature failure, and provide easy installation. We stock a wide range of choices to match your exact shaft size requirements.

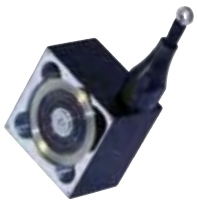
Hubs/Flanges

Hubs and Flanges allow Accu-Coder™ encoders to be easily mounted to industry standard housing styles; NEMA, servo, 5PY, and other styles available.

Protective Covers

The protective *Uni-Cover* helps to keep encoders from damage, and allow a wide variety of encoders to be used in harsh environments. The *Uni-Cover Kit* is equipped with washers and bolts and is compatible with the Models 121, 225, 260, 755A, 702, 775, 776, and 960. It can be mounted on NEMA 4.5" AK motors with a 5.875" bolt hole pattern.

The Linear Cable Adapter (LCA)



The *Linear Cable Adapter (LCA)* is used to transform a Cube Series Encoder into a Linear Encoder. It can be mounted to a Standard or Industrial housed Cube, and provides a low cost alternative for obtaining accurate linear measurement.

Mounting Brackets

The *Uni-Bracket* adapts the Model 260 or the Model 702 Flex-Mount to fit a standard motor mount with a mounting bolt circle up to 5.875", such as NEMA 4.5" AK mount or IEC equivalent.

Cube Series Mounting Bracket are used to mount measuring wheels to Cube and 702 Series Accu-Coders™. Available in two types: ***single pivot*** which pivots vertically, and ***dual pivot*** which pivots vertically and longitudinally.

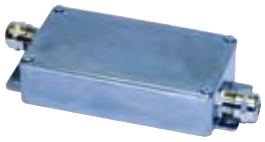
The Tru-Trac™ Mounting Bracket secures the TR1 to your assembly for perfect linear measurement.

Measuring Wheels

Often used to obtain linear motion feedback from a rotating shaft, EPC carries measuring wheels in a large range of surface finishes (urethane, rubber, knurled, grooved). See chart in Encoders Measuring Wheel section on the internet, detailing applications and temperatures for proper mating to nearly any surface. Available in a variety of both English and metric circumferences, to provide linear measurement in a host of different manufacturing applications.

Power Supplies, Anti-Rotational Mounts, RX/TX Converter/Splitter/Repeater

Power Supplies, Mounting Brackets and RXTX



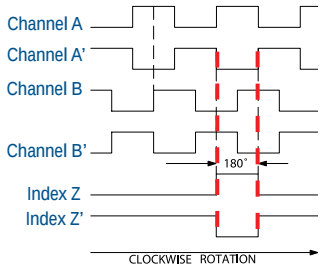
Terminology and Charts

A glossary of terms used in an EPC ordering guide.

Encoder- An encoder is an electro-optical feedback device used for measuring distance, motion, speed or position. Encoders produce output signals proportional to the distance or angle of shaft rotation.

Incremental Encoders- Provide signals to a controller in the form of a square wave. EPC's *current* product line of Linear, Stainless Steel, OEM, and Motor Mount encoders all use incremental outputs.

Incremental Quadrature Waveform



Channel- A path along which information in the form of an electrical signal is passed.

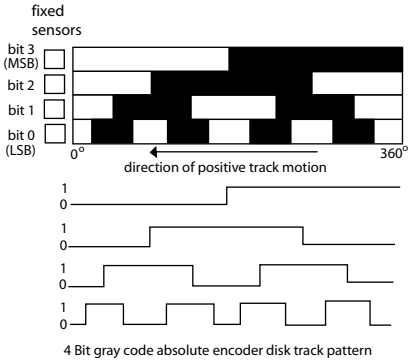
Single Channel Encoder- Will only have Channel A, often called a tachometer.

Quadrature Encoder- Has two output channels electrically phased 90^{0} apart. (A, A', B, B') By monitoring the phase shift of both channel A and channel B, direction can be determined.

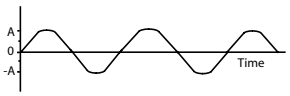
Index or Marker Pulse- A separate output channel that provides one count per revolution (Channel Z). It maintains a home, center, or reset point relational to the other signal channels.

Index Gating- Refers to the relationship the index channel (Channel Z) has to Channels A and B. (See red lines on waveform above) EPC can provide a variety of quadrature phasing and index gating options. Contact Customer Support for more information

Absolute Encoder- Provides an absolute measure of shaft position, even after power outages, in gray code, natural binary, or binary waveforms.



Absolute Gray Code Waveform



Sine Waveform

Sine Wave Encoders- Use the phase relationship of a sine wave to detect motion. Sine waves are continuous, providing virtually an infinite number of data points. *Sine Wave Encoders are available at EPC; Contact Customer Service for more information.*

Cycles Per Revolution (CPR)- The number of counts generated *per channel* for each revolution of the encoder shaft. Ex: A quadrature encoder has 4 channels, therefore a 1000 CPR encoder generates 1000 counts per revolution of the encoder disk, or 4000 counts total.

Pulses Per Revolution (PPR)- The total number of counts (pulses) generated for each revolution of the encoder shaft.

Interpolation- A process of increasing the resolution of an encoder, by sub-dividing counts on one cycle of a sinusoidal waveform. The use of interpolation allows an encoder to generate high-resolution output without increasing the size of the disk to make room for additional resolution lines, eliminating the need to increase the overall size of the encoder.

Conversion Chart

A handy reference for converting fractions to decimals to millimeters

Fractions — Decimals — Millimeters

Fraction	Decimal	mm	Fraction	Decimal	mm
1/64	.0156	0.396	33/64	.5156	13.096
1/32	.0312	0.793	17/32	.5312	13.493
3/64	.0468	1.190	35/64	.5468	13.890
1/16	.0625	1.587	9/16	.5625	14.287
5/64	.0781	1.984	37/64	.5781	14.684
3/32	.0937	2.381	19/32	.5937	15.081
7/64	.1093	2.778	39/64	.6093	15.478
1/8	.125	3.175	5/8	.625	15.875
9/64	.1406	3.571	41/64	.6406	16.271
5/32	.1562	3.968	21/32	.6562	16.668
11/64	.1718	4.365	43/64	.6718	17.065
3/16	.1875	4.762	11/16	.6875	17.462
13/64	.2031	5.159	45/64	.7031	17.859
7/32	.2187	5.556	23/32	.7187	18.256
15/64	.2343	5.953	47/64	.7343	18.653
1/4	.250	6.350	3/4	.750	19.050
17/64	.2656	6.746	49/64	.7656	19.446
9/32	.2812	7.143	25/32	.7812	19.843
19/64	.2968	7.540	51/64	.7968	20.240
5/16	.3125	7.937	13/16	.8125	20.637
21/64	.3281	8.334	53/64	.8281	21.034
11/32	.3437	8.731	27/32	.8437	21.431
23/64	.3593	9.128	55/64	.8593	21.828
3/8	.375	9.525	7/8	.875	22.225
25/64	.3906	9.921	57/64	.8906	22.621
13/32	.4062	10.318	29/32	.9062	23.018
27/64	.4218	10.715	59/64	.9218	23.415
7/16	.4375	11.112	15/16	.9375	23.812
29/64	.4531	11.509	61/64	.9531	24.209
15/32	.4687	11.906	31/32	.9687	24.606
31/64	.4843	12.303	63/64	.9843	25.003
1/2	.500	12.700	1	1.000	25.400

Commutation- A feedback signal generated by the encoder that provides position information to a motor controller so that the controller can apply current to the appropriate armature coils to induce torque and rotation of the motor shaft.

Temperature Ratings- The temperature ranges shown are listings for the ambient temperature that the encoder can endure. Remember, heat from a motor, shaft frequency, and the environment will influence the ambient temperature. Encoder Products Company stands behind their specs, and will not publish ratings higher than what is guaranteed.

Output Types- Selection of the Output Type Is Usually Dependant On The Controller. EPC Provides 4 Output Types:

- Open Collector- Current Sinking Output
- Pull-Up- Contains an Internal Pull-Up Resistor to the positive Supply Voltage
- Push-Pull- (Totem Pole) A combination of sinking and sourcing outputs
- Differential Line Driver- Provides Complimentary Output (A, A', B, B') Channels; a superior choice in electrically noisy environments or with long cable runs.

Terminology and Charts

Tolerance Charts

All tolerances for shafts and bores produced by EPC are based on the ANSI B4.I-1967, R1987 standards, Class LC5, fit.

EPC g6 Shaft Tolerance Limits

Shaft Size	Maximum Tolerance Limit	Minimum Tolerance Limit
1/4", 0.250"	-0.0002"	-0.0006"
5/16", 0.3125	-0.0002"	-0.0006"
3/8", 0.375"	-0.0002"	-0.0006"
1/2", 0.500"	-0.00025"	-0.00065"
5/8", 0.625"	-0.00025"	-0.00065"
5 mm	-0.0002"	-0.0006"
6 mm	-0.0002"	-0.0006"
8 mm	-0.0002"	-0.0006"
10 mm	-0.0002"	-0.0006"

EPC H7 Bore Tolerance Limits

Bore Size	Minimum Tolerance Limit	Maximum Tolerance Limit
3/16", 0.1875"	-0.000"	+0.0005"
1/4", 0.250"	-0.000"	+0.0006"
5/16", 0.3125	-0.000"	+0.0006"
3/8", 0.375"	-0.000"	+0.0006"
1/2", 0.500"	-0.000"	+0.0007"
9/16", 0.5625"	-0.000"	+0.0007"
5/8", 0.625"	-0.000"	+0.0007"
3/4", 0.750"	-0.000"	+0.0008"
7/8", 0.875"	-0.000"	+0.0008"
1", 1.000"	-0.000"	+0.0008"
1-1/8", 1.125"	-0.000"	+0.0008"
1-1/4", 1.250"	-0.000"	+0.001"
1-3/8", 1.375"	-0.000"	+0.001"
1-1/2", 1.500"	-0.000"	+0.001"
1-5/8", 1.625"	-0.000"	+0.001"
1-3/4", 1.750"	-0.000"	+0.001"
1-7/8", 1.875"	-0.000"	+0.001"
5 mm	-0.000"	+0.0005"
6 mm	-0.000"	+0.0005"
8 mm	-0.000"	+0.0006"
10 mm	-0.000"	+0.0006"
11 mm	-0.000"	+0.0007"
12 mm	-0.000"	+0.0007"
14 mm	-0.000"	+0.0007"
15 mm	-0.000"	+0.0007"
19 mm	-0.000"	+0.0008"
24 mm	-0.000"	+0.0008"
25 mm	-0.000"	+0.0008"
28 mm	-0.000"	+0.0008"
30 mm	-0.000"	+0.0008"
32 mm	-0.000"	+0.001"
35 mm	-0.000"	+0.001"
38 mm	-0.000"	+0.001"
40 mm	-0.000"	+0.001"
42 mm	-0.000"	+0.001"
43 mm	-0.000"	+0.001"

Accuracy- The measurable distance between an actual pulse to the theoretical perfect position. Accuracy specification is expressed in either degrees, arc minutes or arc seconds. In a typical incremental encoder disk, there are 21,600 arc minutes per revolution and 1,296,000 arc seconds per revolution. Accu-Coder™ encoders are extremely accurate due to our proprietary disc manufacturing, and strong mechanical assembly.

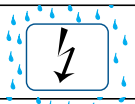
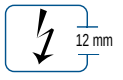
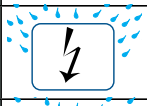
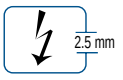
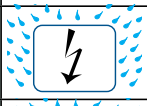
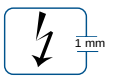
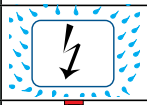
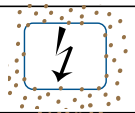
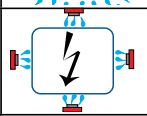
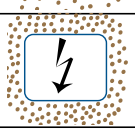
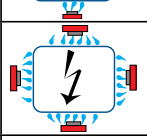
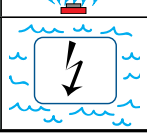
CE (Conformite European or European Compliance)- Sets standards for essential electromagnetic compatibility within European Markets for all electrical and electronic equipment. CE compliant equipment will not interfere with other equipment, but is only applicable to European products and is not an indicator of quality. Only select CE if your encoder is going to be used in European systems.

ROHS and WEEE Compliance- International regulations controlling the use of hazardous substances in electronic components. Specifically, these regulations require that components be free of lead and other specific hazardous substances. See the compliance statement on website homepage. Compliant encoders are available from EPC. Call Customer Service for details and certification.

Sealing- A Shaft or Bearing Seal will be provided to obtain IP64 or greater protection. Sealing is recommended in harsh environmental conditions to protect the internal optics of the encoder, and to provide longer life for encoder bearings. EPC uses only precision ball-bearings tested to the toughest specifications.

IP Ratings Chart and Information

IP Ratings are a system designed to classify the degrees of protection or sealing that your electrical component has from foreign objects, such as fingers, tools, dust, and moisture. This system is recognized in most European Countries and is outlined in BS EN 60529. This classification system uses the letters IP, abbreviated for "Ingress Protection", followed by two digits. The first digit represents protection your component has against solid objects, including the protection from hands, tools, wires, dust, etc. The second number represents the components protection from liquids. The larger the IP number, the greater the protection.

1st Digit	Protection Against Solids	2nd Digit	Protection Against Liquids
0	No Protection	0	No Protection
1	Protected against solid objects greater than 50 mm	1	 Protected against vertically falling drops of water
2	 Protected against solid objects greater than 12 mm	2	 Protected against direct sprays of water up to 15° from the vertical
3	 Protected against solid objects greater than 2.5 mm	3	 Protected against direct sprays of water up to 60° from the vertical
4	 Protected against solid objects greater than 1 mm	4	 Protected against water sprays from all directions- limited ingress permitted
5	 Dust protected	5	 Protected against low pressure jets of water in all directions- limited ingress permitted
6	 Dust Tight	6	 Protected against strong pressure jets of water in all directions- limited ingress permitted
		7	 Protected against water immersion between 15 cm and 1 m for a duration of 30 minutes

Ordering/Delivery/Technical Support

Ordering Through a Distributor
Encoder Products Company has distributors across the United States and Canada. Call 800-366-5412 and ask a Customer Service Representative for a distributor in your area.

Part Numbers
Accu-Coder™ part numbers are found on the model Datasheet Use the appropriate *Ordering Guide* for your particular model. It is important to specify the complete part number. If you are reordering, the serial number of the unit being replaced will help speed the ordering process. Ordering with incomplete information may delay product delivery. In addition, Encoder Products Company cannot assume responsibility for errors when a part number is incomplete. If you need help creating a part number, contact Customer Service.

Product Lead Time
Standard lead time is 4 to 6 business days. Expedite Service is available upon request. Accessories are generally in stock and available for quick delivery. Contact Customer Service to confirm lead times.

Next Day Express
Single-piece orders for many of our products can ship the next business day without an expedite charge. Contact Customer Service for details.

Expedite Service
One, two, and three working day expedited service is available upon request. Contact Customer Service for applicable expedite charges. Expedited service is done on a “best efforts” basis. In some cases a part shortage or other unforeseen factor may cause an expedited order to ship late. In such a case, the expedite charge is prorated.

Confirming an Order
Confirmation by mail or fax is required for all telephone orders. Please be sure the order is clearly marked “confirmation”. Please check your purchase order against the acknowledgment that Encoder Products Company faxes to you. To ensure accuracy, a Customer Service Representative will check your confirmation against your order.

Change Orders
To change an order, ask for a Customer Service Representative. For faster service, either have your purchase order number or Encoder Products Company’s sales order number available. Service charges are assessed for some changes, including order cancellations. Contact Customer Service to determine applicable charges.

Shipping Methods
Orders will be shipped out by UPS or Federal Express. All shipments are F.O.B. factory.

Consignment & Evaluation Units
If you are a new OEM account or have a new OEM application, consignment or evaluation units may be available for up to 60 days Contact Customer Service for complete details.

Technical Application Support
Our Technical Support professionals are available to assist you in your application needs - whether its selecting the right encoder for your application, troubleshooting a new installation, or connecting your new encoder to your motion control system.

Custom Design Service
If your application calls for a solution that cannot be solved using off-the-shelf-products, EPC's Custom Design Service may be just what you need. A simple phone call to Customer Service will put our expertise to work for you.

Expert Cross Reference & Retrofit Service
Encoder Products Company understands the importance of time when you have a machine down. Through its free Cross Reference and Retrofit Service, and thanks to a thorough library of specifications and dimensional information for a wide range of competitive encoders, EPC offers expert assistance for the cross-referencing and/or retrofit replacement of most domestic and foreign optical rotary encoders. In addition, serviceable replacements can often be found for encoders that use other technologies. As a final service, for those hard to find units, EPC can often suggest an alternative approach that will get you back up and running. We have provided an Expert Cross-Reference Service page on our website. It provides you with part numbers of competitors encoders, and compares them with Accu-Coder™ encoders, so that you can begin the cross-referencing process.

Direct Replacements
Encoder Products has identified some of the encoders on the market that are currently hard to find or replace. We have labeled these “Direct Replacement Encoders”

Warranty/Returns/Repairs

Warranty Policy

Products manufactured by Encoder Products Co., Inc. (EPC International, Inc.), are warranted against defects in materials and workmanship, and are warranted to meet the performance specifications as listed in the current catalog and/or data sheet for the specific product being warranted. This warranty applies to all standard catalog product configurations, with the exception of units with a rated operating temperature exceeding 70° C, for three (3) years following the date of shipment. For units with a rated operating temperature exceeding 70° C the warranty period shall be two (2) years following the date of shipment. During that period, EPC will, at its sole option, repair or replace, at no cost to the customer, products which prove to be defective, provided the defect or failure is not due to misuse or abuse of the product. Any unauthorized attempt to repair the product(s) by the customer, or any unauthorized modifications by the customer, can, at EPC's sole option, cause this warranty to become null and void. In addition, this warranty does not apply to products that have been subjected to abuse or operated in environments that exceed their design specifications. The customer is responsible for shipment of the defective product to the EPC factory. Software products are supplied on a site license basis subject to the same performance warranty provisions; the materials and workmanship provision applies to the distribution media only. NO OTHER WARRANTY, GUARANTEE, OR REPRESENTATION IS EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO WARRANTY FOR MERCHANTABILITY OR FOR FITNESS OF PURPOSE. EPC SHALL, IN NO CASE, BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES OF ANY KIND OR NATURE WHATSOEVER. NOTWITHSTANDING, IN ANY CASE, EPC'S LIABILITY SHALL BE LIMITED TO REPAIR, REPLACEMENT, OR PURCHASE PRICE REFUND, AT ITS SOLE OPTION, ONLY AFTER THE RETURN OF SUCH GOODS WITH CONSENT IN ACCORDANCE WITH THE RETURN POLICY AND WITH SHIPPING CHARGES PREPAID. ANY WARRANTY SERVICE (CONSISTING OF TIME, TRAVEL, AND EXPENSES RELATED TO SUCH SERVICES) PERFORMED OTHER THAN AT ENCODER PRODUCTS COMPANY'S FACTORY, SHALL BE AT CUSTOMERS EXPENSE.

Return Policy

Only products currently stocked by Encoder Products Company may be returned for restocking. Products which have been manufactured or configured to customer specifications are not stocked and may not be returned. Returned products are subject to a restocking fee of $25 or 25% of the purchase price, whichever is greater, and must be returned within 30 days of the date shipped from Encoder Products Company.

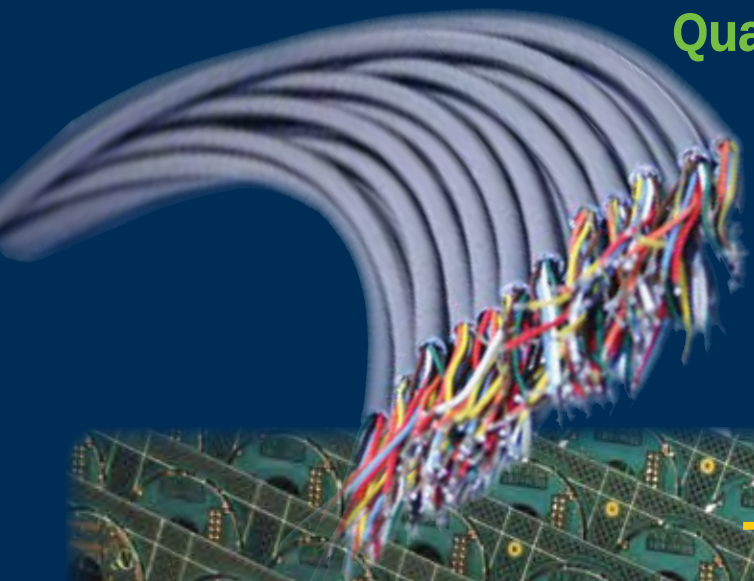
All products being returned must be 100% complete and must be packaged in ORIGINAL PACKAGING. All packaging materials, manuals, other accessories and documentation must be included in the original packaging. Items sent for return consideration will be denied and Encoder Products Company's return policy will not be honored, in the event that a return shipment is received by us improperly packaged, altered, or physically damaged. All items will be inspected and tested upon receipt.

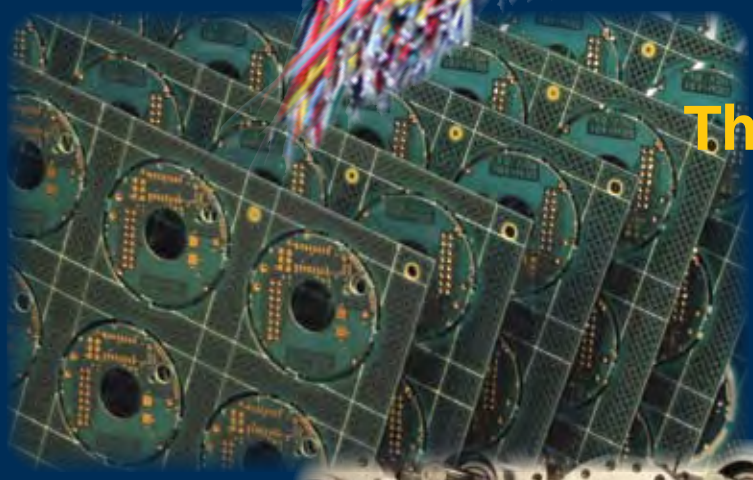
A Return Materials Authorization (RMA) number is required for any item returned for credit. Returns should be sent to our Repair Department. RMA numbers may be obtained by contacting Customer Service in advance. RMA numbers will be issued to original purchaser only.

Repair Services

Each Accu-Coder™ manufactured by Encoder Products Company is backed by our best-in-the-industry three year warranty. If you experience a problem, call our trained professionals. We can often troubleshoot a problem over the phone and determine if a repair is needed. If its necessary to return the encoder for repair, our technicians will perform a complete evaluation and recommend a course of action. In an emergency situation our technicians can often have your evaluation and repair completed, and ready for return shipment, within a matter of hours after receiving your encoder.

Quality Control Starts At Home





The ACCUCODER Advantage

begins on the engineer's drawing table, and is put into place along each step of the manufacturing process. From our automated SMT line that places critical components on PCBs, to our own precision machine shop producing mechanical parts, EPC is in full control of the entire manufacturing process.

The Fastest Shipping Available!

No other encoder manufacturer can deliver a custom encoder shipped to you faster. Period. If you are in a "down" situation, most likely we can have an encoder expedited to you by the next day. Our standard lead time is 4 to 6 working days, which is above and beyond our competition. When you are in need of an encoder, look to EPC for quality, reliability and *fast delivery!*

The ability to control every part of the manufacturing process, allows EPC to manufacture custom encoders with the strictest attention to detail.

CTi Automation - Phone: 800.894.0412 - Fax: 208.368.0415 - Web: www.ctiautomation.net - Email: info@ctiautomation.net